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HUNGARY

IMPLEMENTATION OF PARTY'S SCIENCE POLICY DIRECTIVES EVALUATED

Budapest MAGYAR TUDOMANY in Hungarian No 9, 1977 pp 641-655

[Unsigned article: "Experiences and Timely Tasks in the Implementation of the Science Policy Guiding Principles of the MSZMP Central Committee." Footnote to title: "Document discussed and accepted by the Political Committee on 28 June 1977."]

[Text] Since the appearance of the science policy guiding principles of the Central Committee scientific research and development have contributed to an increasing degree to the solution of the tasks of building a socialist society. Our science policy, resting on principled foundations, has stood the test of practice; in general, scientific research and development work has developed in harmony with the social and economic needs.

The energetic social and economic development and good political atmosphere of recent years have created favorable conditions for the realization of the science policy of our party. The increase in the independence and responsibility of industrial and agricultural plants and enterprises has contributed to the fact that the direct connection of science in the solution of our economic tasks has progressed.

I.

1. In accordance with the science policy guiding principles we have made progress in the practical application of research achievements and the link between producing plants and research sites has become closer and more profound. Our researchers have turned with increased attention toward those tasks of social and economic development which require a scientific contribution. With their participation new production cultures have developed in our homeland, for example in the petrochemical, rubber, vehicle and electronics industries; a computer technology industry has been established; significant achievements have been born in work which enhances crop production and animal husbandry; and complex agricultural production systems have been adopted. Outstanding results have been achieved even on an international scale in a few areas of science. In the area of the social sciences the proportion of research uncovering lawful relationships of the development of the socialist society has increased

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and the results of this research work have given considerable aid in laying the foundations for important political decisions and in forming social awareness. The cultivators of the sciences have played a significant role in the solution of public culture and public education tasks and in spreading scientific information and Marxism-Leninism.

Intellectual and material resources have not been concentrated adequately on the most important tasks. The possibilities for an international division of scientific work are still not taken into consideration enough and remnants of the autarkic view still have an effect.

A more effective utilization of material and intellectual resources has been held back by the fact that longer range social and economic developmental goals requiring much research have been formulated only in some areas. This has also contributed to the fact that research areas which should not be developed or which should be de-emphasized have not been defined unambiguously.

2. The rate of growth in research and development expenditures exceeded that of the national income by about two times. The expenditures doubled in 6 years; almost 14 billion forints, about 3.5 percent of the national income,\* was available for research and development in 1975.

Utilization of the research expenditures was not sufficiently concentrated and thus, despite the significant increase, the material and instrument provision for research and development did not improve sufficiently; the share of investments within expenditures did not increase.

In contrast to the science policy guiding principles an extensive development of the research base was determinant even after 1969.

The number of those employed in the area of research and development increased significantly; in 1975 more than 80,000 people worked in this area. Such indexes of the output of researchers as, for example, the number of publications and innovations, showed in general a stagnating or decreasing trend. The number of research sites increased considerably despite the fact that a few research sites were combined and a few other research institutes were integrated into enterprise frameworks. The extensive development is in part a function of the fact that several educational institutions were transformed into academies and that new branch of industry organizational institutions were created. This increased the number of research sites included in statistical observation.

In accordance with the guiding principles the share of the social sciences increased in the structure of the research base and there was a modest increase in provincial and university research.

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\* The proportion of the national income expressly devoted to research and development was smaller than this, about 2.6 percent according to conservative estimates.

The situation of university research is the most unfavorable within the research base and in several places this endangers conditions for modern instruction and the long range tasks of expert training. The share of the universities lags behind to an unjustified degree in the area of research expenditures per researcher and in the area of foreign study trips. A planned and institutionalized linkage of the intellectual capacity concentrated in the universities into the solution of stressed research tasks remains an unsolved problem.

3. Research cadre developed in a favorable direction as a whole. The professional and ideological preparedness of the researchers increased and talented young people joined in the research work.

Despite a number of measures researcher mobility was not increased. In many cases the interest relationships (e.g., income, acquiring scientific degrees, possibility for foreign study trips) of researchers working in research sites of various organizational types -- enterprise, Academy, university -- are not in harmony with our basic science policy goals.

Scientific public life as a whole developed in a healthy way. The view of researchers in science policy questions became more critical and more self-critical and their assumption of public life tasks was characterized by responsibility and care. At the same time several factors hold back an improvement in scientific public life. In some cases subjectivism, personal antagonisms and professional jealousy can still play a defining role. Some of the party organizations do not act consistently enough against these phenomena. Monopoly situations still exist in our scientific life and in some cases they can even develop today. Critical evaluation or recognition of scientific achievements and of the application of scientific results are not satisfactory.

The institutional frameworks for scientific qualification developed in the spirit of the guiding principles. The themes of the majority of the dissertations submitted were in harmony with social needs but the increase in quality lagged behind what is desired; the doctoral degrees especially lost some of their earlier scientific value. Forms of scientific qualification based on creation, collective work and theses developed but the application of these forms is not yet broad enough and so the effect exercised on scientific life is not adequate.

In regard to the number of and rates of increase in granting scientific degrees there are unjustifiably large disproportions among the several scientific areas. The opportunities for earning scientific degrees are especially unfavorable for researchers working at enterprise research sites. Researchers in the technical and agricultural sciences are in a disadvantageous situation for attitudinal reasons; the scientific work is indispensable for adaptation activity and for further development of licenses is not adequately recognized.

4. Our international scientific contacts expanded significantly. The development of the international situation and the development which took place in economic cooperation with socialist countries had a favorable effect on the development of international scientific contacts.

A large number of joint research and development themes were adopted in the multilateral cooperation programs of the socialist countries. The realization of these, however, is still only in the initial stages and modern forms of cooperation (joint research or laboratories and institutes operated jointly) have hardly developed as yet.

We are participating in social science research conducted on the basis of ideological cooperation among the fraternal parties of the socialist countries. There has been progress in the area of research on our tasks deriving from common political goals, becoming better acquainted with each others' experiences in society building and discovering the laws of socialist social development.

The guidance of international scientific contacts has not yet become an organic part of science guidance; the work of the most important guiding organs is not adequately coordinated in this area. We have not concentrated on the research directions which are most important for us and thus international cooperation has not adequately decreased domestic research needs and the role of this cooperation in ending the remnants of autarky lags behind what is needed. The experiences of the large number of study trips are not exploited adequately. The management of international scientific contacts is unnecessarily complex and bureaucratic.

5. In the wake of the science policy guiding principles there were a number of changes in the system of science guidance; the Science Policy Committee of the Council of Ministers was created, a system for coordinating branches of science was developed, the reform of the Academy began and the planning, financing and management system for research and development became an important tool for science guidance.

The guidance system which developed has well served a strengthening of the harmony between research and development goals and social needs and has improved the planned nature of research and development work.

a. The National Long Range Scientific Research Plan (OTTKT) adopted in 1972 has had a significant role in increasing the planned nature of research and development for it has defined the chief directions of research serving our long range goals and the special purpose research programs connected with the basic developmental trends of the people's economy. The medium range planning work of the various ministries, chief authorities and research sites has improved.

But the results achieved in increasing the planned nature of scientific research and development are not yet satisfactory. The desired mutual effect and harmony among the chief directions of social and economic development, scientific development trends and long range goals of scientific research and development and international scientific cooperation and domestic research have not developed. The economic development plans have only an indirect effect on research and development.

b. The financing and management system has well served to provide a material foundation for research and development activity and has been an important tool for realizing plan goals. The economic regulator system has increased the independence of research sites and the development of greater initiative. The financing of research and development activity and the financial management of research sites have become simpler and more flexible. Central funds for the chief authorities guiding research have been created and this creates increased possibilities for financial influence over research work.

At the same time the present financing and management system has created differing interest relationships for the independent research institutes operating as enterprises from the budget and for university research sites, creating an incorrect orientation in some areas. It does not adequately encourage concentration on stressed themes and in other cases it encourages services and production to a greater degree than justified. Thematic and financial plans are not adequately coordinated. A mutual interest has not developed between researchers and users in regard to practical utilization of research results. The financing of research and development has not been resolved in a reassuring way in agriculture; a technical development fund is not generated from agricultural production and the total of central, budgetary support has remained unchanged since 1968.

c. Organization for guidance of research and development has developed in accordance with the principles formulated in the science policy guiding principles and has well served the realization of our science policy goals.

The increase in the planned nature of guidance and realization of the OTTKT has brought to the fore guidance requirements in accordance with themes and programs. The role of branch of science coordination has gradually decreased. Only in the social sciences has the demand for branch of science coordination increased, primarily in the interest of ensuring a uniform coordination of research and the ideological orientation of research, given the dispersed nature of the base. Increasing the role of chief authorities supervising research sites and coordinating their activity have become necessary methods of guidance work within the organizational system of guidance.

In the past period science guidance has not been able to provide adequate orientation toward the solution of the most important research and development

tasks. A number of factors played a role in this; very many organs take part in science guidance and the cooperation and coordination among them is not satisfactory; even state guidance at the top level is divided in important areas of research and development; the division of labor and forms of cooperation among various government committees interested in science policy questions have not been clarified adequately; and the leaders of ministries supervising significant research sites (the Ministry of Metallurgy and the Machine Industry, the Ministry of Heavy Industry) are not members of the Science Policy Committee.

6. We have achieved significant results in providing information for scientific research and development work and guidance. Possibilities for providing thematic information to research sites have developed, national record keeping on research and development themes has begun, research statistics have been modernized and the creation of a social sciences information system has begun. But there is no clearly formulated conception for building up a uniform research and development information system. Cooperation and a further development of coordination within branches of science and among branches of science are held back by the fact that conditions for mutual information and orientation are not satisfactory. We do not have modern tools for providing the increasing quantity of information and we do not have sufficient experts with modern information. The material resources turned to this purpose are scattered. Our links to international information systems are essentially unresolved and uncoordinated.

7. Technical and agricultural research and development activity has the greatest role in creating a more organic link between science and practice and in better satisfying economic needs. (By technical and agricultural research and development is meant all research -- regardless of the branch of science -- which lays the foundations for or directly aids technical progress in the people's economy, primarily in industry and agriculture.)

a. Technical and agricultural research and development work adjusted to economic policy goals has effectively aided the realization of economic development plans, especially in those places where it was linked to central developmental programs or to international economic cooperation.

There has been a significant development in the researcher base carrying out technical and agricultural research and development tasks or in the capacity thereof. The organizational integration of research and development and the creation of research-development-production associations in the recent past have been effective.

b. The practical application of research results was most successful in the trusts and large enterprises. A large share of the research results

connected with product development or type development was put to use. But the ratio of technological research was not satisfactory.

Despite the progress achieved since 1969 in practical utilization of research and development results we cannot yet say that every enterprise handles its technical development tasks in accordance with their significance. A significant part of the technical development funds of the enterprises was not used in the past period. Some of the producing organizations still shy away from the risks associated with introducing new scientific achievements, shy away from introducing the manufacture of modern products, using modern technological procedures and from carrying out the operational and work organization tasks associated with this.

c. The purchasing of licenses -- especially in agriculture -- has increased significantly and has developed much substantively. In both industry and agriculture many of the truly significant developmental achievements derived from a successful adaptation of foreign scientific and technical innovations. But despite the development the purchase and utilization of licenses lag behind our possibilities and the need dictated by our economic conditions. The very broad research thematrics -- especially in industry -- and the value system based thereon do not aid an increase in license purchases; indeed, in many cases they have a contrary effect. The lack of planning in acquiring them and the bureaucratic agreement procedure preceding authorization have held back an even broader application of licenses and new manufacturing procedures. Effective coordination, competition and complementary utilization of license purchases and domestic research have not been ensured.

8. The stipulations of the science policy guiding principles pertaining to stressed development of the social sciences have been implemented as a whole.

The importance of the social sciences has increased and there has been a favorable change in the thematrics of research; the ratio of research work turned to timely questions, especially to uncovering the developmental laws of the socialist society, has improved. A significant role in this was played by the medium range theme proposals of the Agitprop Committee of the Central Committee, formulated after the 10th and 11th congresses, as well as by the national and ministry level guides of the OTTKT.

The favorable political atmosphere of recent years and the good link which has developed between politics and science have fundamentally determined the development of social sciences research work. Researchers have turned more courageously and in general more responsibly to problems earlier considered "difficult" and the social sciences as a whole now offer a much better shaded picture and more profound analyses of our socialist society than ever before.

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The positions of Marxism-Leninism in the social sciences have strengthened. One cannot speak of the existence or influence of an inter-dependent anti-Marxist system of views. The general theoretical level of research has increased; the theoretical Marxist preparedness of the cultivators of the social sciences and the culture of the social sciences have become more profound; new research directions and methods of investigation have appeared and spread and social science research has become more varied.

Despite the favorable changes the internal structure of research and the concentration of research capacity are still not satisfactory. The general theoretical and methodological enrichment, the more varied nature of research and the expansion into new areas were not without problems. In some cases the broader theoretical and methodological awareness was accompanied by ideological uncertainty and the insufficiently critical adoption of some bourgeois theories and methods. The inclusion in work on stressed tasks of those working in research sites which do not have this as their chief function remains unresolved.

9. The party organizations and party organs at various levels have done effective work in carrying out the science policy guiding principles. They rely increasingly well on the results of scientific research and increasingly demand the active participation of science and of scientists in laying a scientific foundation for political decisions affecting the most varied areas of social life. Party guidance of scientific life has become an organic part of party work; it has developed in content and in organization and has become richer and more effective.

## II.

In the course of carrying out the science policy guiding principles adopted by the Central Committee of the MSZMP in 1969 creative scientific work has developed and has achieved significant results, the social role of science has increased, and the science guiding activity of party and state organs has improved. Scientific research and development have served the practice of socialist construction more consistently and in a more planned way and have contributed more directly to the realization of our social and economic goals. The guiding principles have stood the test of practice and continue to constitute the basis for the science policy of our party and for the solution of the tasks before us.

The task for the years ahead is for us to accelerate the execution of the science policy guiding principles of the Central Committee and to ensure the conditions necessary for achieving our goals in accordance with new demands and changing requirements.

1. The research base provides an adequate foundation for solution of the ever increasing tasks which devolve on science from the building of a developed socialist society; its further development must be ensured by means of an increased assertion of efficiency requirements.

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a. The increasing social role and significance of science make it necessary to realize over the long range that stipulation of the guiding principles according to which the expenditures for research and development must increase at a rate exceeding the increase in national income.

The task in research work and in development of the research base is a more effective utilization of the resources available, placing into the foreground the quality aspects of development. We must force back those attempts which are aimed at an unjustified increase in research expenditures and those views according to which new tasks be carried out only by expanding research capacity and by bringing in supplementary material resources.

Creating a harmony between the developmental needs of the research base and the resources available requires the creation of the conditions needed for an intensive development of the research base. The supply of modern tools and technical equipment to the research sites must be improved. The ratio of investments -- including investments for machines and instruments -- should increase within research and development expenditures. The build up of superfluous instrument capacity must be prevented and instrument use must be improved.

b. A selective development of the research base is one of the most important ways to increase the effectiveness of research and development. Research and development activity is unjustifiably broad as compared to our conditions and possibilities and to the requirements for effective research. The "critical mass" of expenditures necessary for solving problems in scientific research is increasing with extraordinary speed in every area and so a further development of research in a spectrum which continues to be so broad exceeds the economic possibilities of the country and leads to a scattering of resources and to a decrease in the performance and competitiveness of research capacity. We must strive for a more consistent realization of selection when developing the research base. The research sites must be developed so as to orient them to their tasks, taking into consideration in a far-reaching way our social and economic goals, the requirements for solving the tasks deriving from the internal development of science and our scientific traditions. More use must be made of the possibilities residing in international scientific cooperation.

In the process of selective development there will be, in addition to the stressed research trends, research areas in which we can guarantee only that we keep up and others in which we must put a cut-back on the agenda. The concrete decisions must be carried out gradually after fundamental preparation and with circumspect care for the peculiarities of research work and for the human problems which will arise.

c. Increasing the effectiveness of research work makes it necessary for us to concentrate our material and intellectual resources on the socially and economically most important tasks. This requirement means that we

should spend on each theme just as much as is needed for its effective development and for a swift completion of research. By concentrating resources we must strive to decrease the present dispersion and rigidity of the research network and to develop a research capacity which is competitive even internationally.

We must aid the creation of special purpose combinations and associations among various research sites and enterprises for carrying out certain research programs. The links between research sites and between research institutions and production organizations must be developed further and must be made more effective. Using the tools of economic regulation we must encourage better cooperation between researchers and those using research results. We must create joint interest and in some cases a joint assumption of risk in applying research results and in undertaking long range and medium range research and development tasks.

d. The development of the structure of the research base must be realized on the basis of the priority of the research programs and the elements emphasized in the future (provincial research, university research, the social sciences, etc.) must be in harmony with this. The enterprise research sites, which serve most directly and most effectively the development of forces of production, must be emphasized in development. In justified cases this task must be aided by integrating independent institutes into producing enterprises. The other important area in a structural change of the research base is development of higher education research, primarily university research. It is especially important that the training of new cadres in our universities be based on many-sided and modern information, paying broad scale attention to scientific progress. The conditions necessary for this must be ensured by means of increased material support for universities and colleges. Care must be taken to make better use of the scientific capacity concentrated in the universities by means of continual assignment of tasks and -- where the conditions for this are given -- by bringing this capacity into the solution of stressed research tasks in a planned way.

We must ensure the development of basic research, which is indispensable from the viewpoint of the long range development of science. The assets turned to basic research should increase in the future in proportion to the research and development expenditures.

2. We must strive for a more consistent realization than heretofore of the cadre policy basic principles in the area of scientific research and development.

a. A further increase in the number of researchers is not justified -- with the exception of a few areas of science. But at the same time we must ensure the conditions for greater researcher mobility, in harmony with social, economic and research and development goals. The demand for care in and for the quality of research work must be increased. The technical-

scientific training of researchers and their ideological-political education must be raised to a higher level and the system of training and further training must be better coordinated. The unjustified differences appearing in the material, moral and scientific recognition of those working in research and development sites of different types must be decreased.

b. We must develop further the democratism and critical spirit of scientific public life and the role of professional publicity in evaluating scientific achievements. We must take action against the harmful effects of scientific monopolies by means of a more democratic and broader distribution of scientific public life and professional leadership functions. We must force back the subjectivism which appears in some places in scientific public life; we must force back the view according to which demanding scientific work can be done only in research sites where this is the chief mission.

Care must be taken that research which serves a further development of purchased licenses and the creative application of scientific achievements be awarded suitable scientific recognition. Such research and development work should receive in scientific public opinion the respect corresponding to its significance.

By developing scientific public life we must also aid a greater and broader social and public life activity of researchers which goes beyond scientific life. The participation of science and of the cultivators of science in defining our social and economic goals must be strengthened.

The requirements must be raised in scientific qualification work; more attention than before must be paid to the scientific work of candidates as a whole and concentration on the dissertations must decrease. Use must be made of the possibility of withdrawing degrees in the case of those professional researchers who do not do valuable creative scientific work after winning a scientific degree. We must change that practice according to which the filling of certain positions is tied to superfluous scientific degrees. An open debate must be initiated in professional circles concerning the problems of scientific qualification and comprehensive proposals must be worked out taking this debate into consideration.

3. A further development of our international scientific contacts is an indispensable condition for ensuring the scientific and technical information needed for our social and economic progress and for a development of the domestic research base in a suitable direction. We must work out, in harmony with the guiding principles for foreign economic policy, basic principles pertaining to developmental trends, branch of science ratios and chief goals of international scientific contacts. The development of our scientific contacts with socialist and capitalist countries should take place on the basis of uniform plans. Those organs which guide domestic

research activity should take care of guiding international scientific contacts too.

a. Scientific and technical cooperation with the socialist countries must be expanded and made more effective. We must join in a more planned way, in harmony with domestic research and development tasks, into the joint research themes developed within the framework of the cooperation of CEMA member countries. We should strive to use more effective forms of cooperation and to expand license trade. We must ensure the coordination of guidance of international economic and scientific contacts. We must initiate mutual measures in the interest of improving conditions for scientific cooperation with socialist countries and expanding study trips. In regard to cooperation in the social sciences primary attention must continue to be given to research tasks deriving from our common social and political goals, to uncovering the laws of socialist social development and to a better acquaintance with the society building experiences of each thus contributing to a strengthening of our positions in the international ideological struggle.

b. In the course of developing our scientific contacts with the developed capitalist countries we must primarily modify the present branch of science ratios in accordance with the needs of technical development. In addition we must expand contacts in all those areas of science where the domestic research and development tasks make this necessary and justified.

c. We must increase our scientific contacts with the developing countries in proportion to the development of our economic cooperation, increasing our participation in the satisfaction of their expert needs and scientific research needs.

4. The swift development of the sciences, the increasing social and economic requirements and the changing conditions and tasks of research and development work make necessary a constant perfection of science guidance. The further development of state guidance of science requires primarily a higher level performance of substantive tasks (research and development planning, financing, the system of economic regulators, etc.) and does not make necessary any essential modification of the present organizational system.

Care must be taken that our system of science guidance better suits the differing characteristics of the several branches of science, areas to be guided, and research and development tasks. Branch of science coordination need be maintained only in the area of the social sciences and we must gradually shift to guidance according to research programs, strengthening further the guidance role of ministries and chief authorities. We must further develop the planning and financing system of research and development in accordance with this too.

a. A system for planning research and development must be developed in the course of which harmony and a close link must be created with economic planning.

The basic goals standing before research and development, the resources for research and development work and the magnitude thereof and the desired internal ratios thereof (basic research, research directed at concrete economic goals, research on OTTKT themes and research outside of these themes, etc.) must be defined for medium range plan periods too.

In the course of economic planning we must formulate those medium range and long range tasks requiring considerable research which can serve as a basis for a selective development of scientific research. In planning work we must differentiate research tasks aimed at concrete economic goals from research aimed at uncovering theoretical interdependencies which does not directly serve practical needs. Different points of view and different methods must be used in planning and in supervising these two basic types of research.

The OTTKT will continue to be one fundamental framework for planning scientific research and development. The OTTKT must be re-examined from time to time in the interest of producing greater harmony with social and economic needs and the necessary changes must be made with special regard to research tasks connected with modernization of the production structure and with the guiding principles of foreign economic policy. A medium range research and development plan adjusted to the 5 year plan of the people's economy must be created -- taking the OTTKT as a base. A closer link must be created between thematic and financial planning.

The ministries and authorities responsible for the individual themes should guide the planning for the special programs and chief trends of the OTTKT, in cooperation with the science guiding organs participating in inter-ministry coordination, primarily with the National Technical Development Committee (OMFB) and the Hungarian Academy of Sciences (MTA), on the basis of the work of coordinating councils and the program committees taking care of the operational organization of research work. The enterprises should prepare medium range research and development plans -- as an organic part of their 5 year plans.

b. The financing and economic regulator system for research and development must be further developed in such a way as to better serve the effective concentration of material and intellectual resources on the most important research tasks. The centralized portion of the technical development funds and the branch ratios of use thereof must be defined in the course of preparing the 5 year plans on the basis of the costs of research and development tasks and of programs fixed in the medium range plan.

Task financing should be used only if the tasks or the goals of research and development can be defined and supervised in an unambiguous way. In so far as this cannot be done the necessary expenditures should be guaranteed with special state support for a definite period and under definite conditions. We must prevent institutional financing under the heading of formal task financing. In basic research and in university research we must decrease bureaucratic financing and guidance tied to formal requirements.

The system of economic regulators should better stimulate the solution of stressed tasks and an acceleration in the practical application of research results. It should provide adequate frameworks for a further development of direct contacts between research sites and producing enterprises and should aid a better realization than at present of long range plan goals and tasks in research work.

Maintaining the principles for generation and use of technical development funds, care must be taken, by modifying the generation keys, that there be a harmony between the changing needs and the assets generated at the enterprises which can be turned to research and development. The prescriptions regulating the use of enterprise technical development funds must be reviewed and modernized.

c. The development and operation of a modern information system extending to international scientific progress and to the status and development of domestic research work and the research base is a fundamental condition for more effective guidance of research and development. Research statistics must be developed further and we must create a system for the guidance of research and development and for supplying information for research work which has modern technology and trained experts and which can be linked organically into international cooperation.

d. Provision for the many-sided and ever increasing tasks must be ensured within the existing organizational frameworks for guidance of scientific research and development by refining the sphere of tasks of some organs, by increasing cooperation and the division of labor and by improving the conditions needed for their functioning. The tasks, division of labor and legal regulations pertaining to the sphere of authority or organs, ministries and chief authorities guiding science must be adjusted in the interest of increasing the effectiveness of science guidance.

-- In the work of the Science Policy Committee (TPB) we must strengthen before all else guidance in principle, activity connected with making decisions and a more consistent supervision of the realization of science policy. Greater emphasis must be given in guidance activity to aiding a practical application of research results, coordinating economic policy and science policy, coordinating domestic research and international

scientific cooperation, and a further development of the planning, financing and regulator system for research and development. In the interest of a more comprehensive and more effective guidance of broad work it must develop closer forms of cooperation with other government committees. The composition of the TPB must be modified; the leaders of ministries and authorities with significant research networks should be members of the committee.

-- We must increase further the role and responsibility of the MTA as the supreme scientific forum and as the national organ for science guidance. The MTA should play a greater role in solving tasks connected with increasing the social role of science. In scientific questions the ministries and chief authorities guiding science should seek the prior opinion of the MTA. A special role should be given to the Academy in taking care of basic research and of certain branches of science and it must be entrusted with national coordination of Hungarian participation in international scientific organizations which are not inter-government organizations. On the basis of experiences thus far in connection with reform of the Academy -- placing in the foreground the substantive questions of reform -- there must be an improvement in cooperation among the regional and special administrative organs of the MTA.

-- The role and responsibility of the OMFB must be increased in national guidance of research and development activity directly linked to technical development tasks, especially in coordination of complex tasks embracing the people's economy as a whole or embracing several branches. In addition to working out technical development ideas it should play a central role in development and further development of license policy, in building up and guiding a professional information system and in coordinating international scientific and technical cooperation in socialist and capitalist relationships alike. It should further develop its style of work and should support itself more in its work on the special ministries, the network of experts and the research sites.

-- The initiative and responsibility of special ministries and authorities participating in science guidance must be increased in guidance of their own research sites. They should increase the participation of the research sites in developing branch developmental ideas. It is the task of the special ministries and authorities to make recommendations for national long range and medium range research tasks or for their further development and modification.

They should continue to see to the guidance of certain national research and development tasks as ordered and should cooperate in coordination of work on research themes under the guidance of other ministries and authorities. Bureaucratic elements in the guidance activity of the special ministries and authorities must be decreased and their supervisory role must be increased.

5. Attention corresponding to their actual importance and practical significance in our science policy tasks must be turned to technical and agricultural research and development work.

a. Technical and agricultural research and development must be concentrated primarily on those themes where, in the first place, our traditions, resources and possibilities offer a realistic foundation for achieving new scientific results of international significance and for their economical utilization and, in the second place, where the research needs of certain branches and of stressed developmental goals connected with the transformation of the production structure or with the guiding principles of foreign economic policy must be satisfied. In these themes we must ensure the uniformity of the guidance process from research to the practical application of results and their introduction into production. The ratio of technological research must be increased, primarily in those areas where the domestic industrial background for the introduction of new manufacturing processes is ensured.

b. International scientific cooperation should be closely linked to production cooperation and to specialization and cooperation agreements. In the interest of transforming the production structure and of increasing the competitiveness of our industrial products we must make greater preparations for adapting modern foreign scientific and technical achievements and for subsequent research serving this end. The ratio of sums turned to purchasing licenses and manufacturing processes must be increased within the expenditures for research and development activity. It is a fundamental task of research and development to aid a take-over and domestic application of foreign research results and, where possible, to develop them further.

A coordination system for license activity which more consistently serves economic and technical development interests must be created. In connection with this we must develop information, authorization, record keeping and marketing methods for license purchasing and use which aid better than at present the utilization of foreign technical and scientific achievements.

c. In the interest of accelerating the application of research results not only must science come closer to the needs of the people's economy an important condition for progress in this area is that we make the technical development activity of industrial and agricultural operations more planned and increase the demand for and receptivity toward scientific achievements. It must be made known that one of the most significant reserves for increasing the efficiency of production lies in introducing new technical achievements and manufacturing processes and in adopting modern operational and work organization methods. In the interest of strengthening the link between science and practice there is need for a change in view and for more courageous initiative in the producing enterprises while researchers must pay more attention than before to concrete enterprise possibilities and resources for applying research results.

6. A basic condition for a dynamic development of the social sciences is that we ensure and constantly renew an adequate link and harmony between science and politics. From this point of view it is an especially important task of our science policy that, on the one hand, it guarantee the political and public life conditions for research freedom and, on the other hand, that it realize a correct interpretation of research freedom and responsibility among researchers. The conditions for utilization of social science achievements in political decisions must be improved.

a. The unambiguous assertion of Marxism-Leninism and the strengthening of its positions in the area of the social sciences must be guaranteed by uncovering real social processes and by a Marxist analysis of and by giving Marxist answers to new questions and theoretical and methodological problems connected with the internal development of the social sciences. Debates and resistance to non-Marxist views appearing in the area of the social sciences must be made more effective in the course of this work.

Social science research work aimed at giving answers to new questions, especially research of a generalizing character serving a creative application and further development of Marxism-Leninism, must be encouraged. In social science research the demands and requirements of ideological education and of the international ideological struggle must be taken into consideration in a more conscious manner than heretofore.

b. In the area of the social sciences also greater resources must be concentrated on the stressed research tasks. In the course of developing the social science research network the chief task is to increase the research capacity suitable for uncovering the laws of our contemporary social development. In addition to the chief guides at the national and ministry level and in addition to party assignments comprehensive tasks must be defined from time to time for individual branches of science. Coordination among branches of science must be improved and guidance must be based primarily on the stressed research tasks. Care should be taken that the Social Science Coordination Committee have at its disposal the tools necessary for effective guidance.

The ratio of interdisciplinary research must be increased and the social science research base must be made more suitable for the solution of complex tasks. The scattered nature of the social science research base must be decreased. It must be ensured that researchers working in research sites where research is not the chief mission -- primarily those working in the public collections -- can join in research on stressed tasks.

The activity of the social science associations must be developed further and made more organized.

7. The system and methods for party guidance of science which have developed do not require any essential change. In the future also the party

organs at various levels will deal in the work of their bodies, committees and work communities with questions of scientific research and development and in laying the foundations for political decisions and in decision preparation work they will make use of the results of scientific research work. They should turn greater care to a supervision of the execution of their positions and resolutions connected with scientific life.

More attention than heretofore should be turned in the work of regional party organs to helping technical and agricultural research and development work. Science policy work communities or communist aktiws working with regional party organs should be created -- where justified -- in the interest of increasing the effectiveness of party guidance.

An outstanding role in the acceleration of the execution of our science policy awaits the research site party organizations and the communists working in the area of scientific life. Their science policy activity should be directed primarily at forming the views of researchers and at creating the creative atmosphere indispensable for scientific work. They should place more into the foreground of their work consciousness forming, ideological-political educational work and tasks connected with a further development of the democratism of scientific public life.

8. Realization of our science policy goals presumes not only the developmental activity of researchers, research sites and producing enterprises and the work of science guiding organs and of party organs at various levels active in the area of scientific life but also the understanding, creative work and activity of the broad working masses. As science becomes a direct force of production and as the general culture and the professional culture of the workers increases ever broader social strata join in the practical application of scientific achievements. The realization of our science policy goals and the unfolding of the scientific and technological revolution in our homeland are increasingly becoming an all-social cause and so we must strive to expand the social base for the science policy of our party. In the interest of this we must better coordinate the work of the scientific associations and unions, of the MTESZ [Federation of Technical and Scientific Associations] and TIT [Society for the Propagation of Scientific Knowledge], and of the social organizations and mass organizations and must increase their role in the solution of our science policy tasks.

9. The Political Committee recommends to the Council of Ministers that it put on the agenda the report dealing with the realization of the science policy guiding principles and determine the state tasks for execution. The state organs involved in science guidance should prepare plans for concrete measures to ensure execution and the Science Policy Committee should regularly supervise the realization of these.

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HUNGARY

BENEFITS OF CYCLOTRON TO NUCLEAR RESEARCH STRESSED

Budapest MAGYAR TUDOMANY in Hungarian No 9, 1977 pp 701-702

[Article by Margit Sardi: "Nuclear Physics Research and the Cyclotron Program"]

[Text] On 29 June 1977 the presidium of the Hungarian Academy of Sciences discussed a report the antecedents of which stretch back nearly 2 years. In September 1975 those participating in the presidium session had submitted to them a summary report of the presidium's professional committee concerning a document titled "The Situation, Problems and Prospects of Hungarian Nuclear Physics Research and Applications" which had been submitted by the Department of Mathematical and Physical Sciences. In Resolution No 43/1975, adopted at that time, the presidium judged that the report, otherwise of high quality, did not offer sufficient information for it to be able to take a stand in the question of the cited development of nuclear physics, namely acquiring a cyclotron, and so there was need for the collection and submission of additional data and information.

In the 2 years which have elapsed the Department of Mathematical and Physical Sciences, with extraordinarily broad and profound work, has prepared the requested supplementary material, making use of programs organized for the purpose of preparing for the cyclotron program and of works prepared on this subject. (A 3 day cyclotron symposium held in Debrecen; an ATOMKI [Nuclear Research Institute] survey to determine the social needs and the requirements of social practice, bringing in the affected institutions and research sites; the relevant sessions of the Nuclear Physics Sub-Committee; the joint lecture series of the 3rd and 4th departments titled "Scientific and Technical Questions of Domestic Use of Nuclear Energy;" etc.) In this way the June session of the presidium was presented with a basic, well thought out document supported by facts at every point.

The report stated by way of introduction: "In the course of the past decades there has developed in our homeland a research staff which works very effectively, which is highly regarded even internationally and which represents a significant intellectual value and research potential. However, the status of domestic basic and applied nuclear research as compared

to the present international level can be preserved only we can acquire within the foreseeable future a cyclotron of medium energy." If this is not done or if it is long delayed we must reckon not only with a gradual decline of domestic experimental nuclear research; we would endanger, together with this significant basic science for modern scientific research, certain branches of industry and our preparations to participate in nuclear power production and in development of the nuclear instruments industry; and biological and agricultural sciences research, nuclear medicine (diagnostics and therapy), materials testing (in the metal and semi-conductor industry), environmental protection (swift testing of air and water contamination) and isotope production would suffer serious disadvantages. Realization of the cyclotron program would bring a qualitative change not only in these areas of research and application but would also ensure a domestic background for our participation in international cooperation. The report also summarized the more important data for the planned cyclotron investment (location, costs, conditions for acquisition, etc.).

In this form the document won the general recognition of the participants in the presidium session. The speakers accepted the proposal with unanimous approval. They found especially convincing the verbal supplementation to the reports in which details were given from communications by organs and institutes interested in the operation of the cyclotron (for example, the KFKI [Central Physics Research Institute], the Isotope Institute, the Aluminum Industry Research Institute and agricultural and medical sciences research sites) concerning presently existing and lively needs. They stressed that in these areas the use of the cyclotron will be indispensable and unavoidable within a foreseeable time.

According to the symposium Hungarian experts not only need the use of the cyclotron but also are prepared for its use -- as is indicated by the many-sided practical requirements. Not only can Debrecen offer a home for the investment in the objective sense (a building, the proximity of clinics, etc.) but the "intellectual antecedents" already developed here ensure an adequate foundation for its operation. A staff of experts is available in the persons of Hungarian experts trained at Dubna; the program would serve to utilize the significant intellectual capacity represented by them.

The speakers emphasized that in the present international scientific situation efficient cooperation will sooner or later become impossible without an adequate experimental background. Nor can our participation in international cooperation solve certain practical domestic needs (for example for isotopes with short half-lives). In sum, therefore, the cyclotron program would mean providing a unique research tool, basic to nuclear physics, without which domestic nuclear physics would get into a difficult situation within a few years; it would provide an opportunity for the development of a scientific center in which scientific achievements of

unforeseeable importance might be born and, in addition, a significant practical profit can be expected even though this cannot now be expressed precisely in forints. The cyclotron would serve basic and applied research and the solution of practical problems and this trinity was demonstrated in the planned utilization of the capacity of the installation.

In the opinion of the speakers the proposal submitted is better adapted to the practical scientific requirements and to the material possibilities than it was 2 years ago; in contrast to the 140 centimeter pole diameter cyclotrons long operating everywhere in the neighboring socialist countries the planned equipment has a pole diameter of 103 centimeters but its principle of operation is different and it is more modern as a whole; the investment costs are half to one third and personnel requirements are one half of the earlier proposal and the proposal is suitable for satisfying the most basic social needs at present.

On the basis of all this the presidium accepted the report with approval and decided to ask the first secretary of the Academy, the chairman of the National Technical Development Committee and the chairman of the National Nuclear Energy Committee to make a joint proposal to the Science Policy Committee for acquisition of the cyclotron -- with regard to the sum of the investment and the multiple utilization of the capacity.

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HUNGARY

BRIEFS

THEMES OF BIOLOGICAL RESEARCH CENTER--The work of the Biological Center of Szeged was recently featured on a television talk show. The program was opened with an interview of Academician Dr Bruno F. Straub, executive director of the Center. He stated that 120 researchers are currently employed at the Center. Research is conducted according to specific topics: Basic research is aimed primarily at achieving results in agriculture and the food industries. These results have been extremely encouraging to date. Research in the area of genetics has already led to the improvement of wheat. Other concrete research themes involve photosynthesis and investigation of hereditary factors influencing insect development. Dr Bela Karvaly, biophysicist, spoke about photosynthesis. He said that results indicated that solar energy could be captured and used. Ilona Laczko rounded out the topic of photosynthesis with a discussion of the microorganisms of blue-green alga. [Budapest CSONGRAD MEGYEI HIRLAP in Hungarian 22 Sep 77 p 4]

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TECHNOLOGICAL DEVELOPMENTS IN CONSTRUCTION OF PETROLEUM EQUIPMENT

Bucharest STIINTA SI TEHNICA in Romanian No 9, Sep 77 pp 21, 34

[Article by Engr Toma Doru Lucian]

[Text] For the personnel of the Ploiesti "1 Mai" Enterprise, like for all working people, the five-year plan of the scientific-technical revolution is both an opportunity and a constant obligation to use in production the latest scientific and technological discoveries, to utilize modern production techniques and to continuously raise the parameters for the utilization of the existing machine tools, so that the technological and qualitative features of the petroleum equipment turned out may continue to be on a par with similar makes of best-known foreign firms.

The meeting of these requirements is based on a comprehensive program of scientific-technical studies which involves cooperation with specialized institutes (ICPTSC [Research Institute for Hot Sections], ICEM [Institute for Metallurgical Research], INCREST [Institute for Scientific and Technical Creativity], and so on), through plant applied research on the basis of in-house plan. Moreover, we point out the cooperation with IPCUP [Design and Research Institute for Petroleum Equipment] subsidiaries and the development of research opportunities in cooperation with higher education institutes (Ploiesti IPG [Petroleum and Gas Institute] and Cluj-Napoca IP [Petroleum Institute]).

Great emphasis is placed on cooperation with other Romanian enterprises for the production of subassemblies which make up petroleum equipment capable of meeting the continuously growing requirements in terms of technical and operational parameters and of enhancing the quality and competitive character of these facilities on the foreign market. The cooperation program involves major enterprises such as Bucharest "23 August," Resita ICM (Construction and Installation Enterprise) Brasov "Steagul Rosu," Sibiu "Independenta," and so forth.

The drive to renew and upgrade production processes and use the latest techniques is a major factor in the program for continuously introducing progress in the field of production.

This year alone will see the use of 13 new procedures and the testing of another 8 procedures, while also paying attention to the program for upgrading existing techniques, which involves 14 procedures.

By surveying a conventional production flow, we shall begin with a few aspects relating to the technological changes and innovations which involve hot sections, sections which turn out semifabricated products by forging and which subsequently are processed in the mechanical working sectors. For instance, in these sectors studies have covered a wide area:

- a. Production of steels based on local formulas T 21 Mn slo, T 22 MoCN12, required for specific products of petroleum and mining equipment;
- b. Production of nodular cast iron and use of a Romanian clinkering agent for Romanian cast iron parts;
- c. Use of G2 and E1 refractory dies for molds of cast iron parts;
- d. Use of cold hardening molds (furan resins, Plastovit, Covasil).

In the area of heat treatments, tests were conducted on an installation for removing stress in unsized semifabricated products through vibrations instead of heat treatment in furnaces and stress removal with Electrotermal apparatus.

Furthermore, under the program for self-provision with equipment devices were turned out on the basis of the CIF hardening process. In some cases, such as in the case of preventer pistons, the nitridation thermodynamic treatment was replaced with a CIF hardening treatment.

We cannot wind up this survey of accomplishments in the hot section area without pointing out the project to turn out parts by pressing on DYNAPAK hammers instead of forging. This reduces the machining allowance and hence the time needed for obtaining the finished product. We must also point out the program for mechanizing the forging processes. In this context, devices were turned out for rotating rings during forging and for hot bending swivel bails.

A continuous process of introducing new techniques and modernizing older procedures has been developing in the machining and metal construction sectors.

For instance, in the metal construction shops, impressively large subassemblies of 10-15 m (derrick sections, slides, half-trusses) which must involve accurate sizes, are fitted in very large special devices. This eases the efforts of the fitters' teams and also makes it possible to obtain parts characterized by very accurate structural sizes.

The pipe delivery involves a special machine (oxigas) which permits various inclinations. This results in replacing marking, manual autogenous cutting, and subsequent machining on pipe cutters. The large amounts of metal sheet in metal construction are assembled by automatic and semi-automatic welding in the context of a very wide range of subassemblies: slides, panels, casings, frames, and so on. The sheet edges are machined with the aid of electric cutting heads (TRUMPF type). This involves easy maneuverability and far better conditions than in the case of the methods of chamfering with cumbersome and noisy pneumatic equipment.

A special category of petroleum subassemblies involves mud pumps, drilling rigs, intermediate gearing, drive groups made up of casings (in the case of drilling rigs the casings weigh tons) in which are fitted parts including shafts, cogwheels, couplings, rope pulleys, and so on. These parts are obtained during a large processing cycle on machine-tools.

The machining of these subassemblies and parts involves a major technological section because of the technical conditions required for the assembly of the mechanical components inside them. These conditions involve geometrical parameters: close allowances, disalignments, parallel alignment, truth, and so forth, included in a narrow field of values, on the one hand, and on the other hand, functional parameters which should result in greater reliability of the products.

Our enterprise, through its workshop for self-provision with equipment, designed and produced a number of units with two or more force heads (electrical engines and corresponding transmissions) for the processing of some families of casings. These units include the machines for mud pumps 2 PN-400, 2 PN-630 and 2 PN-1258, the machine for triplex pumps, the machine for pump frames of AC-400 cementing units, and the machine for casings of drilling rigs. The advantages of turning out these units are evident:

- a. Release of large machine-tools and the prospect for performing other work on these machines;
- b. Shorter machining of subassemblies because of the reduction of the auxiliary periods and consequently greater productivity.

The range of processes on the machines turned out under the program for self-provision with equipment has constantly widened. Additional special processes involve:

- a. The trapeze cutter for the shells of mud pumps 2 PN-400 and 3 PN-465;
- b. The aggregate machine for finishing cylinders of the liquid bodies of mud pumps;

c. The aggregate machine for machining, from one setting, the pump frames of ACF-700 cementing units.

This drive continues. The development of new types of pumps results in the designing and production of new families of aggregate machines required for their machining.

Under the program for self-provision with equipment the plant also turned out, in small series, the large SP 1-1000x3000 parallel lathe with mechanical drive of the brake and clutch. Projects involve the SP 1 1000x3000 lathe with hydraulic drive and SP 1 1250x3000 with mechanical and hydraulic drive, respectively, of the brake and clutch.

The development of this lathe has resulted in many savings in terms of foreign currency in consequence of the importation of some pieces of equipment and the resolving of the problems posed by production. In the technological field, the production of this lathe involved the resolving of many problems by the staff of the enterprise. One of these problems was grinding the guides. This was done on a gantry planer.

Moreover, in connection with other special machining on conventional universal equipment, we must point out:

- a. The grinding of ball bearing rings with sizes of  $\phi$  3000 in extractive machines (mining equipment);
- b. The duplication turning of troughing in the rolls of drilling traveling blocks and crown-blocks;
- c. The grinding of crankshafts of cementing machines on a parallel lathe;
- d. The grinding of large parts such as cylindrical shafts and cylindrical drums on parallel lathes with emery strips instead of grinding stones.

Universal lathes also serve to harden the inner and outer surfaces in bodies of blow-out preventers and of the shafts of drilling turbines by the rolling of these surfaces with special devices.

Specific oil equipment involves many gears and this involves the existence of a proper tooth sector which can meet the needs for a large amount of tooth machining.

In addition to machines for tooth milling, toothing by planing and milling, and for toothing conical gear with straight, inclined, and circular toothing, this sector now also has automatic V-shaped

tooth milling machines, machines for grinding cylindrical gear with straight and inclined teeth, and also machines for milling and grinding grooves.

In this sector also, although it is well provided with toothing machine-tools, self-provision with equipment has played a major role. On the basis of in-plant designs the experts turned out a number of devices for machining gear on conventional machine-tools, also two aggregate machines for rough-cutting and finishing teeth of the casings of turn-tables, and thus turned out circular toothing with functional parameters which are superior to those of current gear with inclined teeth.

The continuous modernization of machine-tools, the raising of the functional parameters of this equipment, and the constant trend for automation of controls have resulted in the development of new types of machines among which the machine-tools with numerical control play a significant role.

Two-shaft numerical control lathes are now performing the turning of the buttons on the jaws of drilling bits. The same sector also machines the conical thread of the bodies of drilling bits on DE-MOOR program lathes.

The use of new techniques has also meant projects in other areas of major importance for obtaining superior products. For instance, process lines were developed for machining and assembling subassemblies such as:

- a. Process line for machining pump bodies;
- b. Process line for machining pump frames;
- c. Process line for machining and assembling valves;
- d. Process line for machining crankshafts.

Of course, the program for developing process lines is in full swing. The next stage will see putting into operation more process lines for new subassemblies, such as electromagnetic brakes, ventilated clutches, crankshafts, and so forth.

The development of production lines was also based on a sustained drive to cut down the size range and to standardize specific subassemblies. Hence, the standardization project involved cardanic shafts, ventilated clutches, couplings of mining equipment, parts of drilling bits, and so on.

All this is part of the concerns and successes of a collective of workers who have won world repute for the products of the Romanian industry for the construction of petroleum equipment.

ROMANIA

NEW PROGRAMS DESIGNED TO MAXIMIZE RECOVERY OF PETROLEUM RESOURCES

Bucharest STIINTA SI TEHNICA in Romanian No 9 Sep 77 pp 22-23

Unsigned article

Text On the world market of energy resources petroleum is ranking first and will continue to do so by the year 2000. This involves the expansion of production, research, and design in order to complete the major projects of the petroleum and gas industry.

As stressed in the Directives of the 11th Party Congress, "Geological surveys will focus on increasing the energy resources. Deep drilling for petroleum and gas will be expanded and drilling work will begin on the continental platform of the Black Sea. Oil and methane mining methods will be upgraded in order to raise the efficiency of wells and oil recovery in deposits." The significance of petroleum and natural gas in the economic development of Romania has generated the need for the corresponding expansion of the base of reserves. The sedimentary deposits with petroleum potential and prospects cover more than 85 percent of the country's territory and are distributed in several geographical units. The study of the sedimentary formations in all these units and their geological structure was based throughout the years on an intensive activity of overall research which covered 15,100 wells with more than 23 million meters of exploration and exploitation drilling and a large amount of geophysical surveys and geological mapping. These surveys made it possible to study geological structures up to depths of 3,000-3,500 m. Consequently, future surveys will focus on geological formations at greater depths, which are still little known. Hence, a comprehensive program for Deep Drilling and Exploitation was worked out for this five-year plan.

For the attainment of the goals focusing on increasing the reserves and output of petroleum and gas, the deep drilling program envisions a large amount of drilling for the 1976-1980 period, about 10 percent of Romania's total volume of drilling.

Concurrently with increasing the reserves of hydrocarbons on the basis of geological surveys greater efforts will also be made to increase the recoverable petroleum reserves from the deposits in operation. In this connection, the Program for Increasing the Final Recovery Factor in Petroleum Deposits was worked out. It envisions a drilling volume of more than 1 million m<sup>3</sup> for this five-year plan. Moreover, considering the drilling, research, and exploitation work which will involve structures located down to 3,000-3,500 m, during the 1976-1980 period the drilling volume will be about 3 percent greater than the volume for the 1971-1975 period.

But what are the major problems of research, design, and production? In the first place, the discovery and utilization of new resources of petroleum and gas for which research was intensified in order to determine the conditions of formation and accumulation of hydrocarbons, the formulation of new techniques for discovering these accumulations (on both land and sea), and the study of geological formations by drilling wells which are 6,000, 8,000 and even 10,000 m deep.

In the second place, much attention is being paid to preparing research and design projects which will directly help to implement the petroleum and gas mining plan. In this connection, new products were developed which are used in drilling wells and maximizing the petroleum and gas output. Equipment required for well drilling and petroleum and gas mining plus new techniques were also developed.

It is known that current techniques make it possible to extract on the average about one-third of the petroleum in the deposit, with the rest remaining unused. Therefore, the problem of increasing the mining proportion and of recovering petroleum in the deposit is a current and future matter for experts in the areas of research, design, and production. The comprehensive program in this area envisions the spread of well-known methods which can advance the rate of recovery, such as: the water and gas injection which helps to remove oil from the pores of rocks and the development and use of new methods which can far more effectively remove petroleum from the pores and thus increase the rate of recovery. Adequate methods include underground combustion, injection of water with polymers, carbon dioxide injection, alkaline water injection, and so forth.

Furthermore, efforts are being made to develop techniques for the extraction of petroleum by using mining methods.

The water or gas injection method, which supplements the energy in the deposit and pushes the oil toward the well, is now being used on a wide scale. In special cases, when neither water nor gas yields good results the research workers use the underground combustion method which they devised. By burning a small amount of petroleum the heat is produced which is needed for fluidizing the oil and easier pushing it toward the well.

All these surveys conducted in order to extract more petroleum from the deposit annually make a significant contribution to the implementation of the state plan. Following surveys planned for next years conditions will be created for switching from the current recovery level of about 30 percent to that of more than 45 percent in terms of petroleum from our deposits.

The creative activity of research workers has also had results in the area of best use of oil gas for the obtaining of the greatest possible amounts of products required by the petrochemical industry. Moreover, new machines and devices were developed for the survey of wells and the extended use of automation in the area of drilling and extraction.

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